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OPEN-PIT ANTHRACITE MINING

Recommendations On A Feasibility Analysis

OPEN-PIT ANTHRACITE
MINING

Recommendations
On A
Feasibility Analysis

A REPORT
TO
GOVERNOR MILTON J. SHAPP
AND
THE GOVERNOR'S ENERGY COUNCIL

BY
THE GOVERNOR'S SCIENCE ADVISORY COMMITTEE
PANEL ON ANTHRACITE MINING

JANUARY 1976

FOREWORD

Though annual production declined from 100 to 6 million tons between 1917 and 1974, anthracite may again become a major Pennsylvania industry. The increasing price and shortage of natural gas and petroleum and the environmental restrictions on emissions from the combustion of bituminous coal may create new markets for anthracite in this century. The nation's 20 billion tons lie almost wholly in Pennsylvania adjacent to eastern population centers in need of low sulfur fuel.

This report focuses on open-pit anthracite mining with full restoration to a desirable land use, as an alternative to conventional deep-mining systems. Large scale open-pit mining avoids many of the hazards and problems inherent in deep-mining. Steeply pitching beds, water problems, bad roof and floor conditions and general underground mining safety problems are obviated. Additionally, the large tonnages predicted to be needed lie in beds far underground - a condition not susceptible to efficient mining by conventional surface mining techniques but which can be handled by deep, open pit techniques.

New markets require new economical and environmentally acceptable technologies for large-scale anthracite mining and combustion. Since national priorities focus on bituminous coal, active encouragement of the Commonwealth is needed to achieve such developments by industry and federal agencies.

The Governor's Energy Council's Coal - A Commonwealth Coal Development Program, called for action "to use advanced technologies for mining and combustion of coal . . ." Spurred by Mr. Albert Smigel, Special Assistant for Economic Affairs in the Governor's Office of State Planning and Development, in his paper "Large Scale Anthracite Mining", The Energy Council requested the Governor's Science Advisory Committee (GSAC) to:

. . . recommend ways and means whereby a feasibility study of large-scale anthracite mining could be conducted under the auspices of the Council, including specific areas a feasibility study should address, who could be asked to do it, how much it would cost, etc.

In response, GSAC formed an Anthracite Panel which met in Harrisburg on May 2 and May 30, 1975. This report summarizes the Panel's findings and recommendations.

ACKNOWLEDGMENT

This document is the result of deliberations and discussion by a number of Pennsylvanians, and others who are most familiar with anthracite and with northeastern Pennsylvania, where it is found. The Governor's Science Advisory Committee, through its Anthracite Panel, directed the effort.

Staff assistance in the Panel's work and in the preparation of draft reports was provided by Professor David E. Wojick of Carnegie-Mellon University and his graduate assistants, James McCurley III and F. Edward Stanchic.

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CONCLUSIONS

I. ANTHRACITE HAS GREAT POTENTIAL VALUE FOR PENNSYLVANIA

- It is low in sulfur
- 20 billion tons are located in northeast Pennsylvania adjacent to the power-needy eastern megalopolis.
- Anthracite could provide an environmentally acceptable fuel for eastern cities.

II. AN ANTHRACITE RENAISSANCE DEPENDS ON THREE KEY DEVELOPMENTS

- New large-scale open-pit mining techniques must prove to be feasible with full restoration to a desirable land use in accord with public policy. To be marketable, individual sources must provide a guaranteed supply of 1 to 3 million tons per year for 20 years;
- The costs of production, delivery, and use must be competitive with those of bituminous coal in the eastern market;
- New technologies, such as large-scale combustion methods, with particulate control and high value synthetic fuels, must be developed, soon.

III. ANTHRACITE USE MUST NOT ONLY BE ECONOMICALLY VIABLE, BUT ALSO SOCIALLY ACCEPTABLE

- Individual and community interests must be protected:
- Environmental and socio-economic issues must be delineated and satisfied.

IV. ANTHRACITE DEVELOPMENT IS DEPENDENT UPON AN EARLY FEASIBILITY STUDY AND ADOPTION OF PUBLIC AND PRIVATE POLICIES

- Promoting necessary technological developments and investments in anthracite mining and use;
- Guaranteeing environmental control, land restoration, and protection of individual and community interests;
- Providing services needed for industry to develop.



FINDINGS AND RECOMMENDATIONS

I. ELEMENTS OF A COMPREHENSIVE FEASIBILITY ANALYSIS

Comprehensive investigation of the feasibility of new large scale development of anthracite requires analysis of:

- the costs, technological feasibility, and production levels achievable on sites with open-pit anthracite mining with restoration to acceptable land use;
- potential eastern anthracite markets in competition with bituminous coal and other fuels, and their dependence on technological developments and on national economic, energy and environmental policies;
- environmental and social costs and benefits in renewed anthracite use and of policies to optimize these;
- needs for manpower training programs and transportation and other services in a new anthracite industry;
- financing needs, mechanisms, and controls;
- the roles of government and the private sector in promoting anthracite developments with safeguards of public and private interests.

THE PANEL BELIEVES SUCH A COMPREHENSIVE ANALYSIS, TAKING PERHAPS TWO YEARS TO COMPLETE, IS ESSENTIAL BUT ONLY IF A PRELIMINARY ANALYSIS OF ANTHRACITE COSTS AND MARKET POTENTIAL (RECOMMENDED BELOW) IS ENCOURAGING.



2. AN IMMEDIATE ANALYSIS OF TWO CRITICAL QUESTIONS: COSTS AND MARKETS

Whether large-scale open-pit anthracite mining can succeed depends critically on answers to two questions:

COSTS

Can open-pit anthracite mining at promising sites, with restoration to acceptable land use, provide large-scale production at a price competitive with bituminous coal in the eastern market?

MARKETS

If so, can new long term markets for anthracite be expected to develop, how soon, and on what scale?

THUS THE PANEL RECOMMENDS THE FOLLOWING CONCURRENT STUDIES

COSTS

A cost analysis of open-pit anthracite mining with full restoration, using available geologic data on 3 to 6 promising isolated sites;

If the result is encouraging, additional geologic data at one or two of the most promising sites are needed to provide a definitive cost assessment.

MARKETS

A market analysis, exploring the upper and lower limits of potential eastern markets for anthracite in this century and beyond, in electricity generating plants, synthesis of pipeline gas, and methanol.

Attention should be given to the possibility that the rate of increase in demand for coal and synthetic fuel and electricity as substitutes for domestic oil and natural gas will exceed the nation's capacity to expand its production of bituminous coal.

ISSUES

A preliminary identification of environmental, legal, and socio-economic issues such as:

- water and air pollution and land restoration
- population displacement and community dislocation
- new regional jobs
- creation of necessary financing and services
- institutional arrangements, public and private, to deal with the disposition of these issues

THE PANEL BELIEVES THAT PROPER ASSESSMENT OF THE FIRST QUESTION WILL TAKE 12 TO 15 MONTHS DEPENDING ON THE NEED FOR, AND ABILITY TO OBTAIN ADDITIONAL GEOLOGIC DATA: AND THAT LESS TIME AND EFFORT MAY BE REQUIRED FOR THE OTHER TWO STUDIES.



3. MANAGEMENT, FUNDING AND CONDUCT OF FEASIBILITY ANALYSES

THE PANEL RECOMMENDATIONS

MANAGEMENT

An Anthracite Feasibility Review Council should be appointed by the Chairman of the Governor's Energy Council to provide oversight, review, evaluation, and direction to the feasibility studies. This Council shall have the authority to accept reports, and based on these, to make recommendations to GEC on anthracite development, including whether a comprehensive anthracite feasibility study should be made.

Membership on the Anthracite Feasibility Review Council should include the Executive Director of GEC, the Governor's Science Advisor, the State Geologist, and other appropriate representatives from the Attorney General's Office, the Office of State Planning and Development, and the Department of Commerce, Community Affairs, Environmental Resources and Transportation.

FUNDING

The feasibility analyses should be provided (as budgets permit) by the Governor's Energy Council, the Pennsylvania Science and Engineering Foundation, the Office of State Planning and Development, and the Departments of Environmental Resources and Community Affairs. Federal support from the National Geologic Survey, the Bureau of Mines, the Appalachian Regional Commission, FEA and ERDA should also be sought.

CONDUCT

The study should be conducted by a contractor and/or subcontractor(s).

- one contractor with subcontractors for each specific task
- one contractor for each task

The contractor(s) could be a

- for profit research or engineering organization
- non-profit research institute
- university

To insure full participation, inputs from certain groups and professionals (i.e., state and local government agencies, anthracite producers and their associations, labor, environmental and citizen groups, bankers, industries including utilities) must be included.

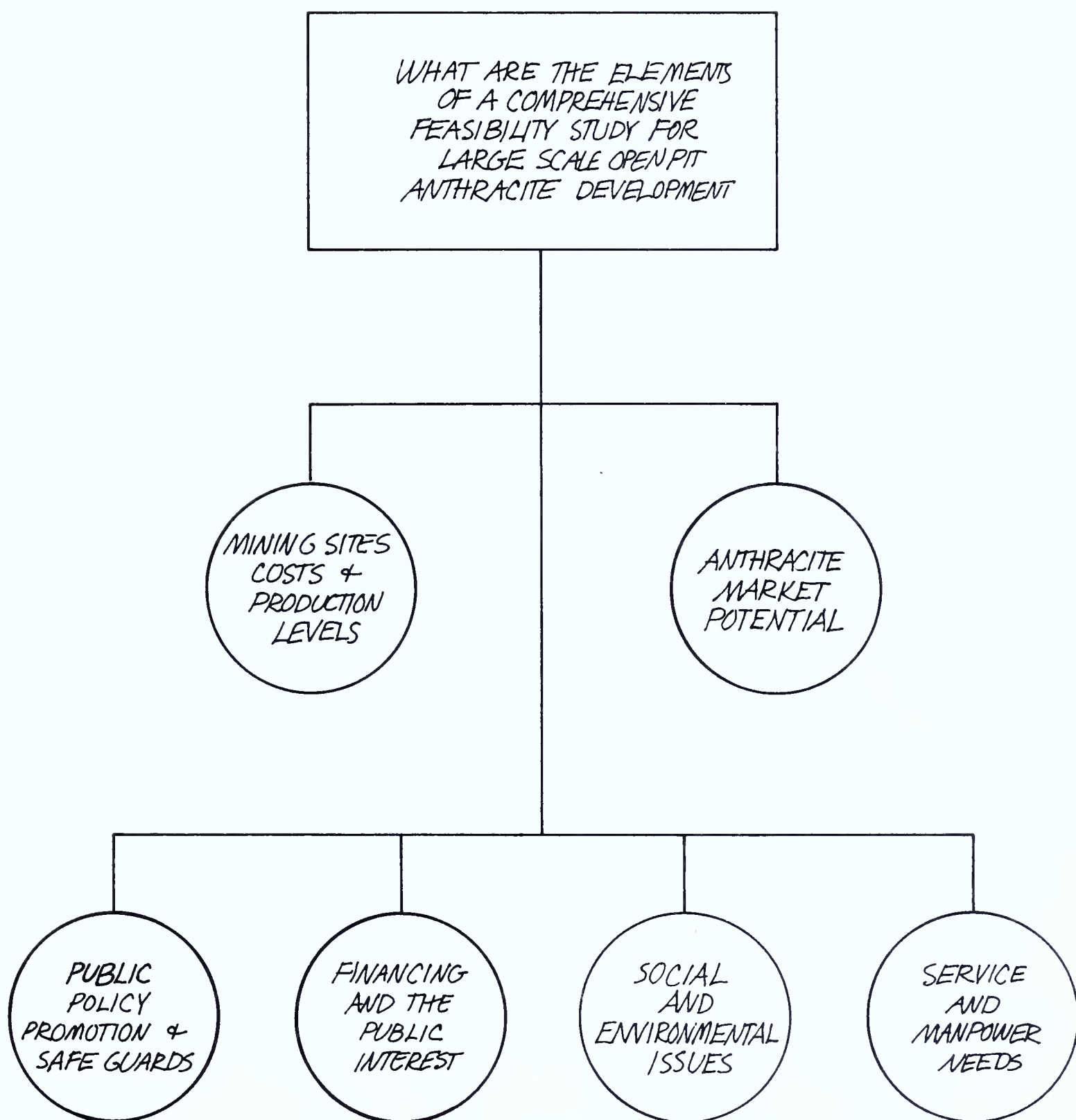


APPENDIX A

SPECIFIC ISSUES IN A COMPREHENSIVE FEASIBILITY ANALYSIS OF LARGE SCALE ANTHRACITE DEVELOPMENT

(A more detailed display of key issues
which must be dealt with in a compre-
hensive feasibility study)





CAN LARGE-SCALE OPEN
PIT MINING AND RESTORATION
BE DONE WITHOUT DISRUPTION
OF COMMUNITIES AND AT A
COMPETITIVE COST?

A

B

A

WHAT SITES?

WHAT COSTS?

NEED
LOCATION
OF
COAL

SITE
CHARACTERISTICS

CAPITAL
COSTS

OPERATION
AND
RESTORATION

ARE THERE
CRITICAL SITE
DEPENDENT
FEATURES

- GEOGRAPHIC DISTRIBUTION
- PROFILE WITHIN SITE (DEPTH, ETC.)
- COAL CHARACTERISTICS (SULFUR, ASH, BTU CONTENT)
- WATER RATIO

- CURRENT LAND USE
- POPULATION AT SITE

ARE THERE
PROMISING
DEPOSITS IN
ISOLATED
AREAS?

- LAND & EQUITY TO CURRENT OWNERS
- INTEREST ON CAPITAL
- SERVICES (ROADS UTILITIES, ETC.)
- EQUIPMENT
- POSSIBLE MINE MOUTH GENERATING OR SYNTHETIC FUEL PLANT

- LABOR
- FUELS & UTILITIES
- MATERIALS
- MAINTENANCE

SUCH AS

OPTIMUM
SCALE

WATER
PROBLEMS

COST
PER
TON

SCOPE &
PACE OF
PRODUCTION

• PUMPING
AND
TREATMENT
COSTS
• END-USE

CAPITAL
COSTS

WATER
COSTS

WASTE RATIO
& OPERATION
COSTS

RESTORATION
COSTS & RETURN

B

POSSIBLE
COST ADVANTAGE
IN LARGE-SCALE
MINING

WHAT
PRODUCTS?

WHY?

WHAT ABOUT
RELOCATION &
RESTORATION
COSTS?

- ECONOMIES OF SCALE
- NO UNDERGROUND PROBLEMS

- COAL
- POWER
- RESTORED LAND
- SYNTHETIC FUELS

I. PROBLEM: SITES, SCHEDULES, AND ANTHRACITE COSTS IN OPEN-PIT MINING

Sites, costs, products and schedules are the major items of interest in a technology and cost analysis of open-pit anthracite mining.

CONSIDERATIONS

1. SITES

Data are needed on the number of sites available and the amount of anthracite in each. The internal field distribution is determined by factors such as depth and composition. The availability of a site is influenced by population distribution and current land use patterns.

The character of the anthracite is determined by measuring its sulfur content, ash and BTU values. The best sites contain coal with a relatively low sulfur content, low ash and high BTU values.

2. COSTS

The major capital costs and operation/restoration costs are broken down as follows:

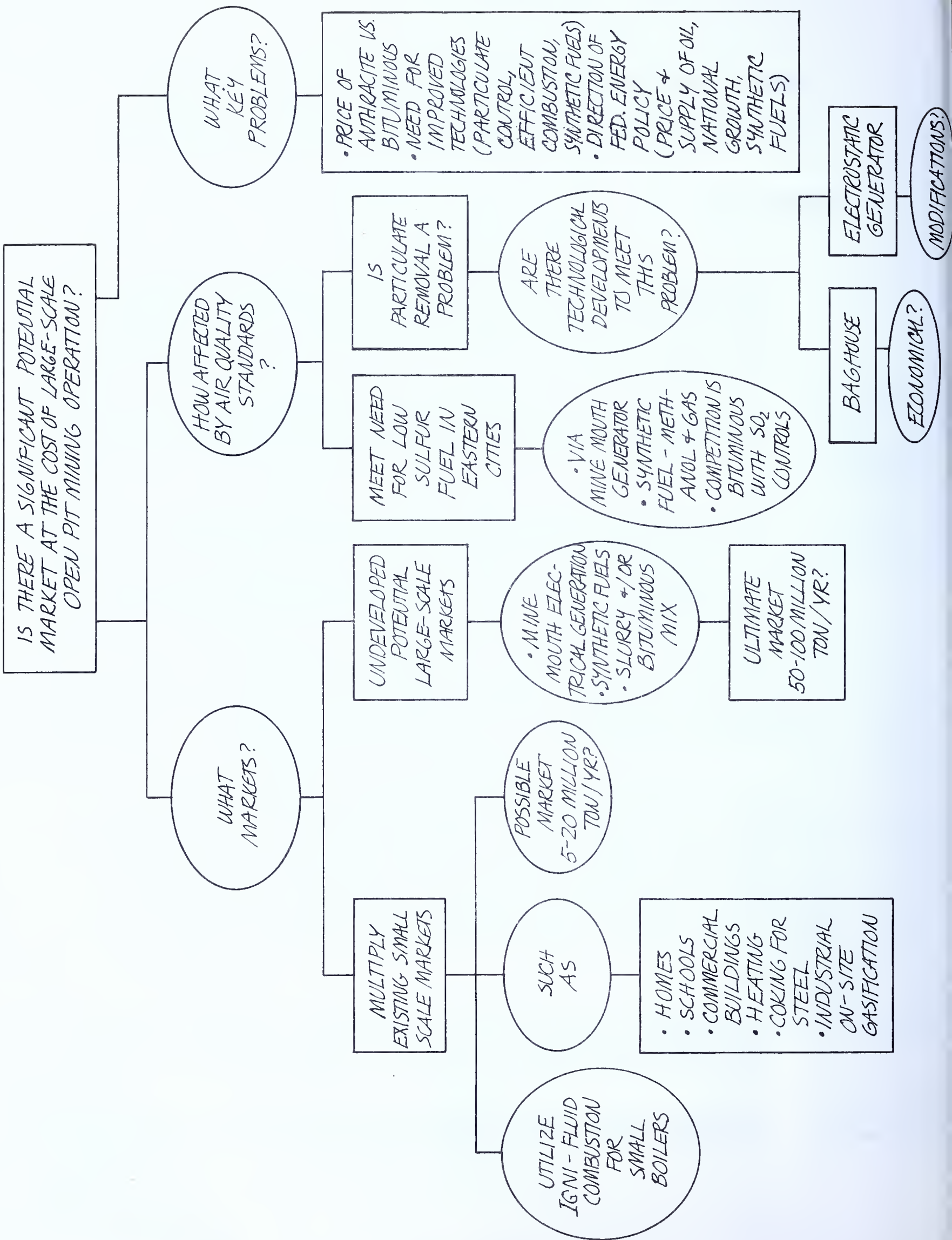
<u>Capital Costs</u>	<u>Operation and Restoration Costs</u>
Land	Labor
Equity	Fuels
Equipment	Utilities
Services (including roads, sewers, and power)	Materials
Relocation of population (if appropriate)	Maintenance
	Interest on Capital

The site-dependent factors and costs are critical. Waste-ratio - waste versus depth for different sites - is the major consideration. The ratio of amount of coal available to the time it takes to mine is another. Water pumping, treatment and disposal costs are also a major consideration. Finally, the cost of coal per ton is determined by factors such as excavation, time scale of operation, initial equity costs, water pumping and treatment cost, restoration costs and returns, and nature and locale of site.

3. PRODUCTS

Efficiency of recovery is difficult to predict. Estimates range from 50% to as high as 90% for the large-scale, open-pit technology. This factor should receive particular attention in a feasibility study.

Aside from the value of restored land, no other by-products of anthracite mining (such as other mineral resources) are known.



II. PROBLEM: THE MARKET FOR ANTHRACITE

A market and technology survey is needed to determine markets, effects of air quality standards, costs, and key problems in expanding the use of anthracite in competition with bituminous coal and other fuels.

CONSIDERATIONS:

1. POTENTIAL EXPANSION OF EXISTING MARKETS

Can the existing modest-scale markets for anthracite for use in homes, schools, coking, and gasification be expanded, possibly by use of ignifluid combustion for small boilers? Could the potential of this market equal or exceed 20 million tons year? What factors (natural gas shortage, price, technology) are critical to such expansion?

2. POTENTIAL NEW LARGE-SCALE MARKETS

Will new large-scale markets for anthracite development for use in electrical power generation (possibly mine mouth), synthesis of pipeline gas, or synthesis of methanol as a substitute for gasoline? What potential markets exist for use in a slurry or bituminous mix? Could the potential for such uses equal 50 to 100 million tons a year as some suggest?

Extrapolation of the effects of diminishing supplies of natural gas and petroleum in the next two to three decades on the demand for electricity and for synthetic fuels is central to this question.

3. TECHNOLOGICAL BARRIERS

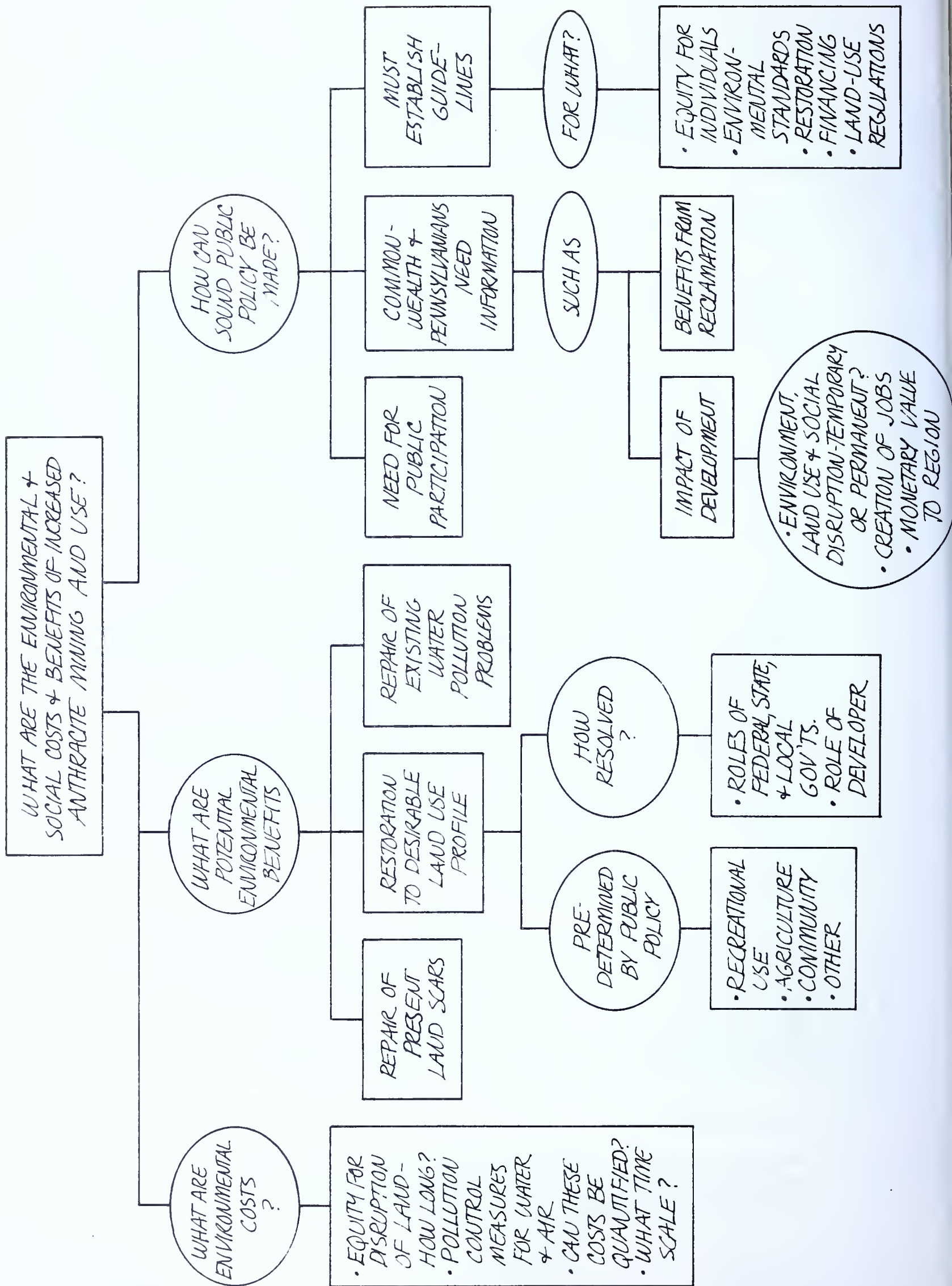
For the large-scale uses suggested above, certain technological developments, such as efficient large-scale combustion methods, improved particulate removal in combustion gases, and large-scale gasification on methanol synthesis are needed. What are the prospects for such developments with what time tables and costs? What factors limit these prospects?

4. COMPETITION WITH BITUMINOUS COAL

Can expansion of bituminous coal mining, transportation, and conversion to synthetic fuels occur at a sufficiently rapid rate and at a sufficiently low price to meet new markets as natural gas and petroleum become scarce? Will there be a gap in the latter part of this century that can provide an opportunity for anthracite deposits adjacent to the eastern population and manufacturing centers? What time-table for development of anthracite is required to seize any such opportunity?

5. PUBLIC POLICIES

How will these possible futures be affected by different national policies on energy, capital generation, environment, population relocation, employment, and limits to growth?



III. PROBLEM: ENVIRONMENTAL AND SOCIAL ISSUES IN ANTHRACITE DEVELOPMENT

The environmental and social impacts of an open-pit anthracite mining operation must be assessed including environmental costs and benefits, land-use conflicts, and how the public can make a fully informed decision.

CONSIDERATIONS:

1. COSTS

Land-use problems must be analyzed as to whether they are temporary or permanent, together with options for their equitable resolutions.

As to open-pit mining, this will temporarily disrupt the land, water, and air. Can these environmental costs be quantified, and what will be the time-scale of such disruptions?

2. BENEFITS

Can there be environmental benefits through restoring land to a desirable, publically pre-determined use? What priority should be given to recreational, agricultural, residential, or other use? What are the roles of the developer, state, local, and federal government in such determination? Can existing culm banks, land scars, and acid mine drainage problems be repaired through such open-pit mining operations?

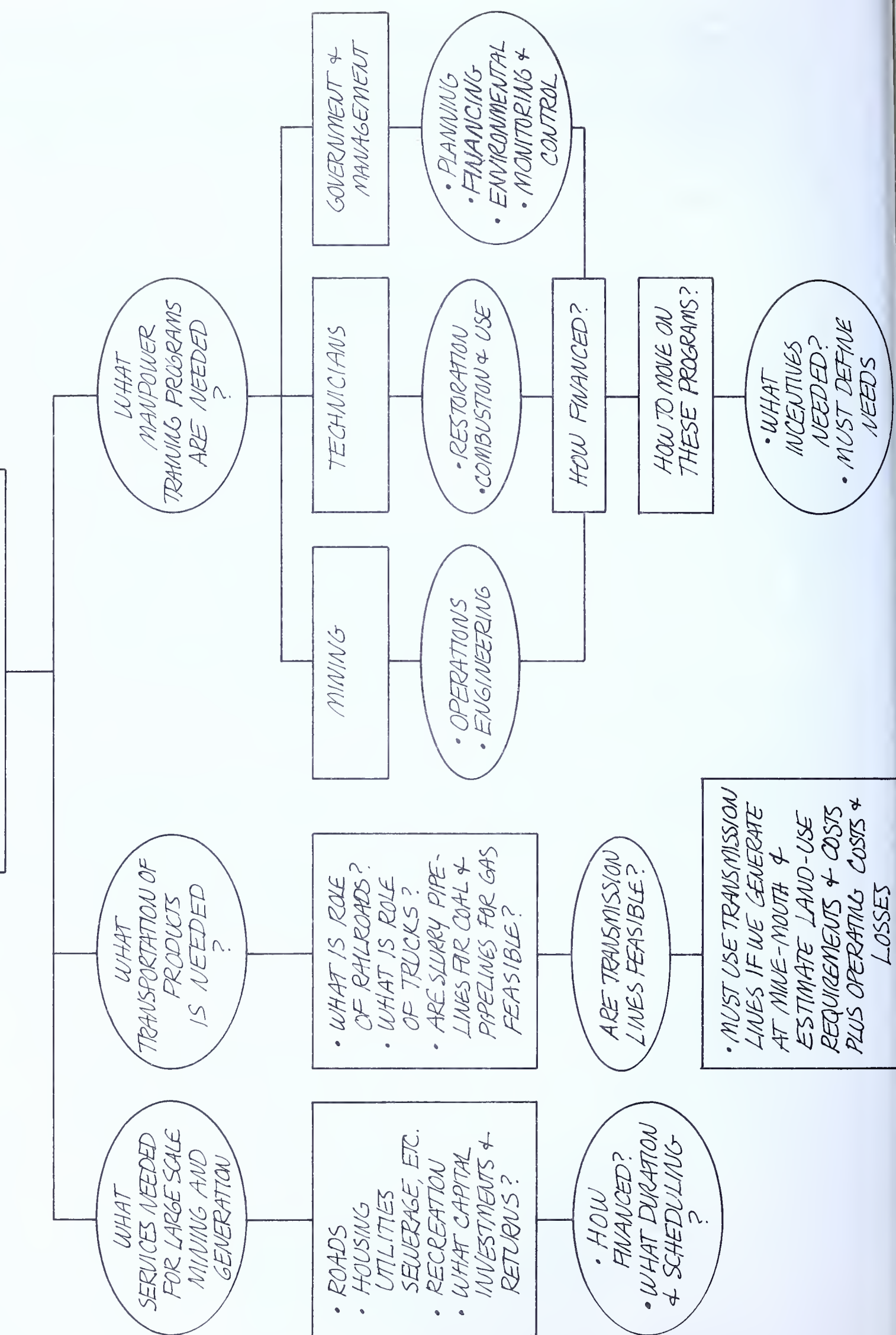
3. AN INFORMED PUBLIC

Can the public make a fully informed decision regarding public control of, and participation in, new anthracite mining developments? How can information be effectively dispersed on financing, environmental standards, restoration, equity for individuals, and land-use regulations? What will be the benefits from reclamation, the impact development will have on jobs and the local economy, and will changes thrust on the environment, land-use, and society be temporary or permanent?

4. NATIONAL ENERGY NEEDS

The uncertain price and supply of foreign oil may be an additional incentive for anthracite development. Some estimates place the Arab supply of oil at 20-30 years at current rates of usage. According to the U. S. Geologic Survey, there are 20 billion tons of anthracite in the ground and as much as 15 billion tons are recoverable. Ten billion tons of anthracite could aid us in significantly meeting our energy requirements for the next 100 years if mined at the rate of 100 million tons per year. How significant is such a potential to effective operation of the economy of the eastern U. S.?

WHAT MANPOWER AND SERVICES ARE REQUIRED FOR ANTHRACITE DEVELOPMENT?



IV. PROBLEM: SERVICES AND MANPOWER IN ANTHRACITE DEVELOPMENTS

Services are needed for a large open-pit mining project. Of primary importance are transportation for the coal, and manpower training programs.

CONSIDERATIONS:

1. SERVICE NEEDS

The services needed for the project include roads, recreation, housing, utilities, and sewerage. An estimate of scheduling and financing required for these services is needed. Capital investment and predicated returns must not only be identified, but also determined as to duration.

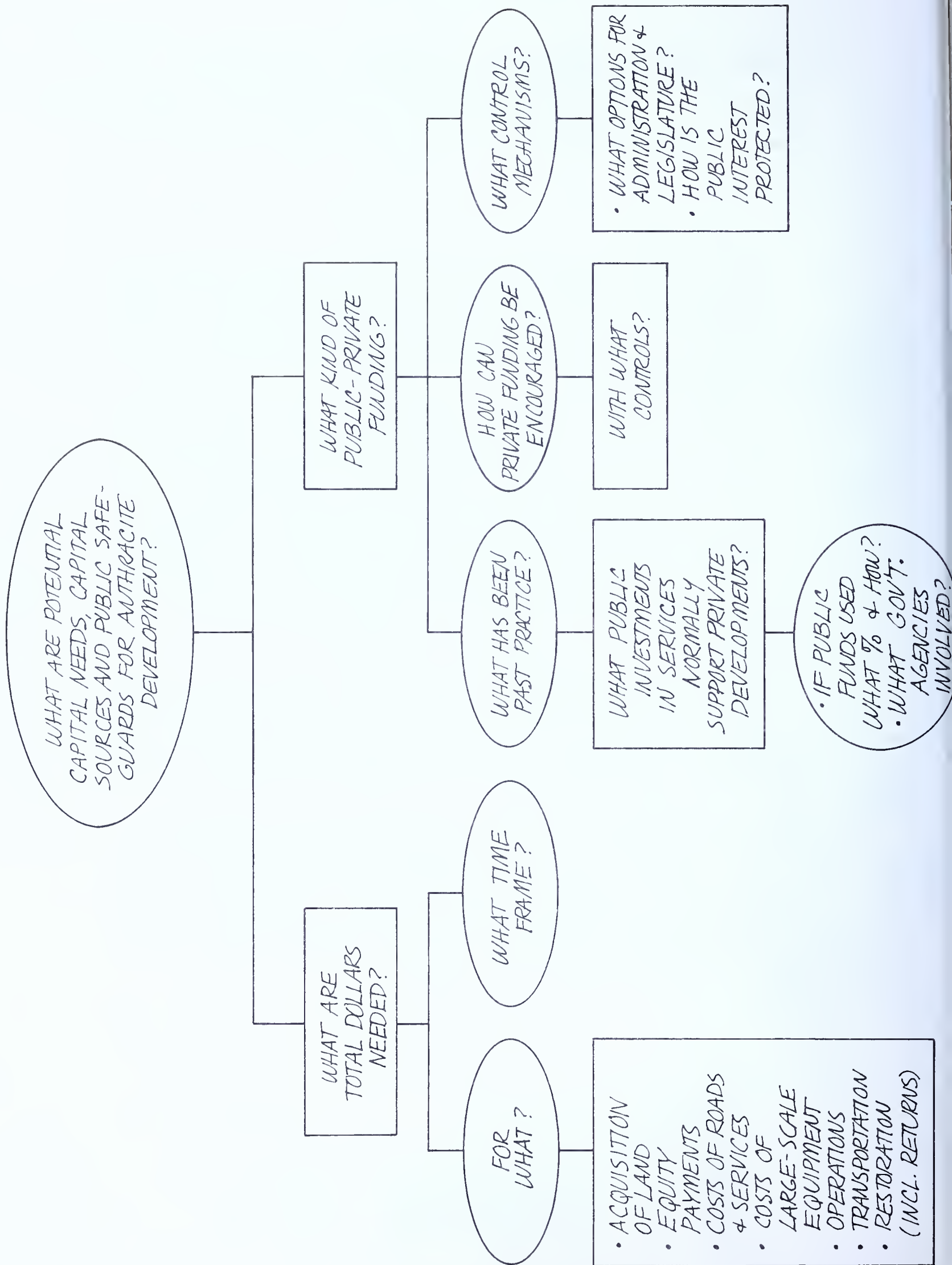
2. TRANSPORTATION

In considering product transportation, questions are raised about the role of railroads and the number and type of trucks. Novel modes of transportation, such as pipelines, belts or transmission lines, may be considered. Transmission lines are a necessity if mine-mouth generation is used, but before this decision can be made, land-use requirements and costs, plus operating losses and costs for the transmission lines must be estimated. A complete analysis of alternatives is essential to any serious consideration of product transportation.

3. MANPOWER

A survey of personnel needs and of existing training programs is required. The incentives needed to initiate such programs must also be defined in the survey. Manpower training programs might be publicly and privately managed. They would be geared toward the planning, financing, monitoring, control, and environmental needs of the program.

University-level manpower training programs are needed for mining operations and engineering. Training programs might also be required for technicians to deal with restoration and combustion. These programs are necessary not only because of new technologies, but also to alleviate the shortage of qualified personnel needed to provide the required geologic data. What are the needs and how can they be met?



V. PROBLEM: FINANCING AND THE PUBLIC INTEREST

Total funds needed and the public/private financing structure must be determined.

CONSIDERATIONS:

1. CAPITAL NEEDS

Funds are needed for land acquisition, equity payments, roads, services, large-scale equipment, operations, transportation, and restoration (including returns from restored use). The schedule of capital needs and cash flows versus time must be defined.

2. CAPITAL SOURCES

What are the demands, and possible private and public sources, for anthracite developments? What are the precedents, options, and control mechanisms to indicate what might be feasible? Does past practice indicate that public investments in services normally support private developments, how they are used, and which government agencies are included?

3. SAFEGUARDS

The administrative and legislative options for protection of public interest should be pinpointed.

WHAT ARE THE OPTIONS
FOR DEVELOPMENT
OF NEW PUBLIC POLICIES
AND CONTROLS?

WHAT
IS THE
CLIMATE FOR
DEVELOPMENT
?

- DEPENDENT ON
STATE POLICY
- NEED FOR A
DEFINED
FEDERAL
ENERGY POLICY

WHAT
PRESENT &
DEVELOPING
POLICIES ARE
RELEVANT

WHAT
OPTIONS FOR NEW
STATE/LOCAL
POLICIES &
SUPPORT?

RESTORATION

- HOW TO
GUARD AGAINST
LONG-TERM
ENVIRONMENTAL
SOCIAL & ECONOMIC
PROBLEMS?
- PERFORMED BY WHO,
WHAT SAFEGUARDS?
- HOW DONE? WHAT
REQUIREMENTS
?

MUST HAVE
PUBLIC INPUTS

- ROLE OF
STATE & LOCAL
GOVERNMENTS
- ROLE OF
DEVELOPER
- ROLE OF BANKS
- PERMIT RE-
QUIREMENTS

- EMINENT
DOMAIN
- EQUITY
- REGULATION OF
FINANCING
- OPERATIONS &
MANAGEMENT
- ENVIRONMENTAL ASPECTS WHILE
OPERATING

VI. PROBLEM: PUBLIC POLICY AND LEGAL-REGULATORY CONTROLS OF ANTHRACITE DEVELOPMENTS

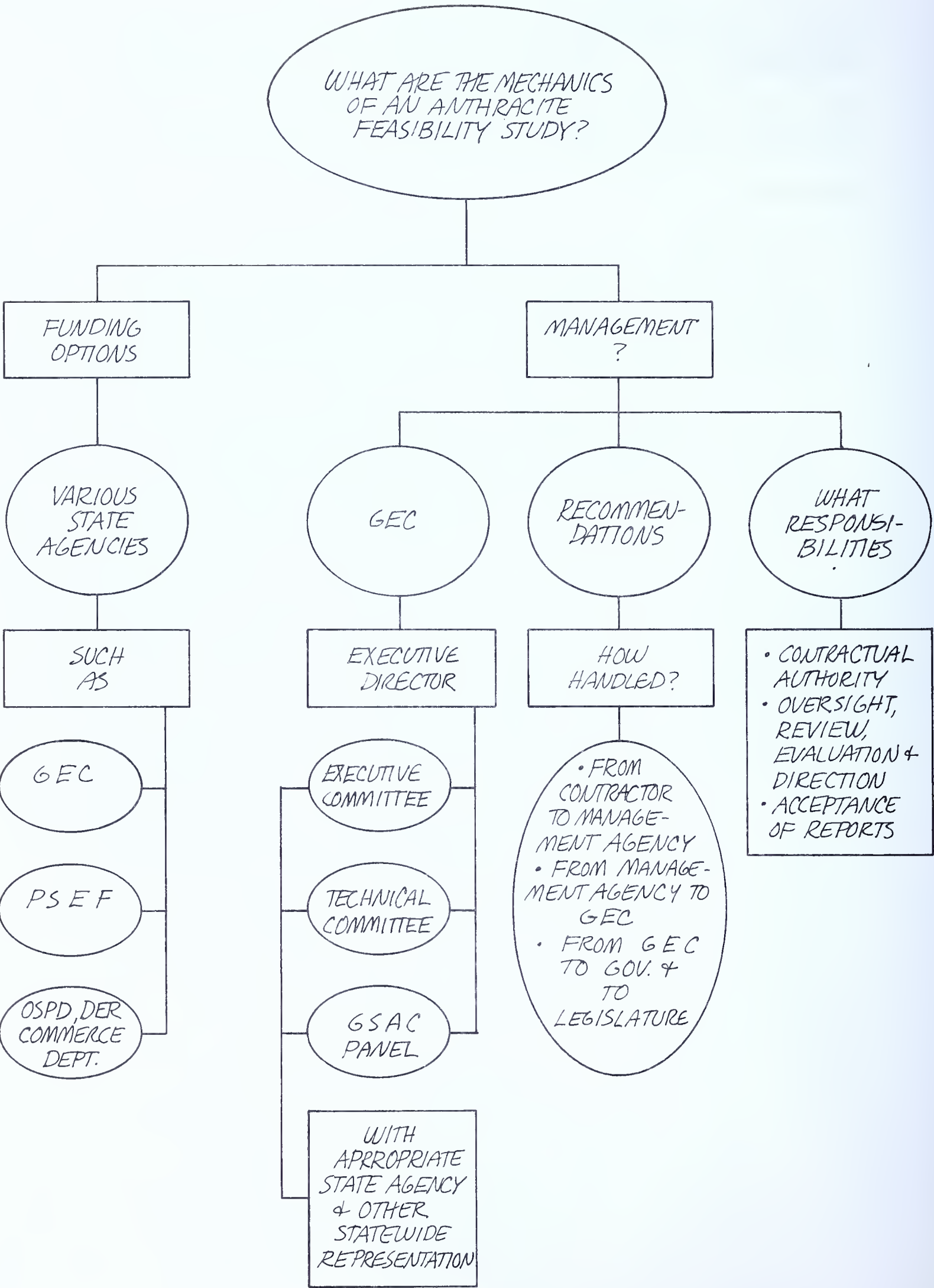
What is the climate for development of new public policy and legal-regulatory controls, and what options are there for new state and local policies/support?

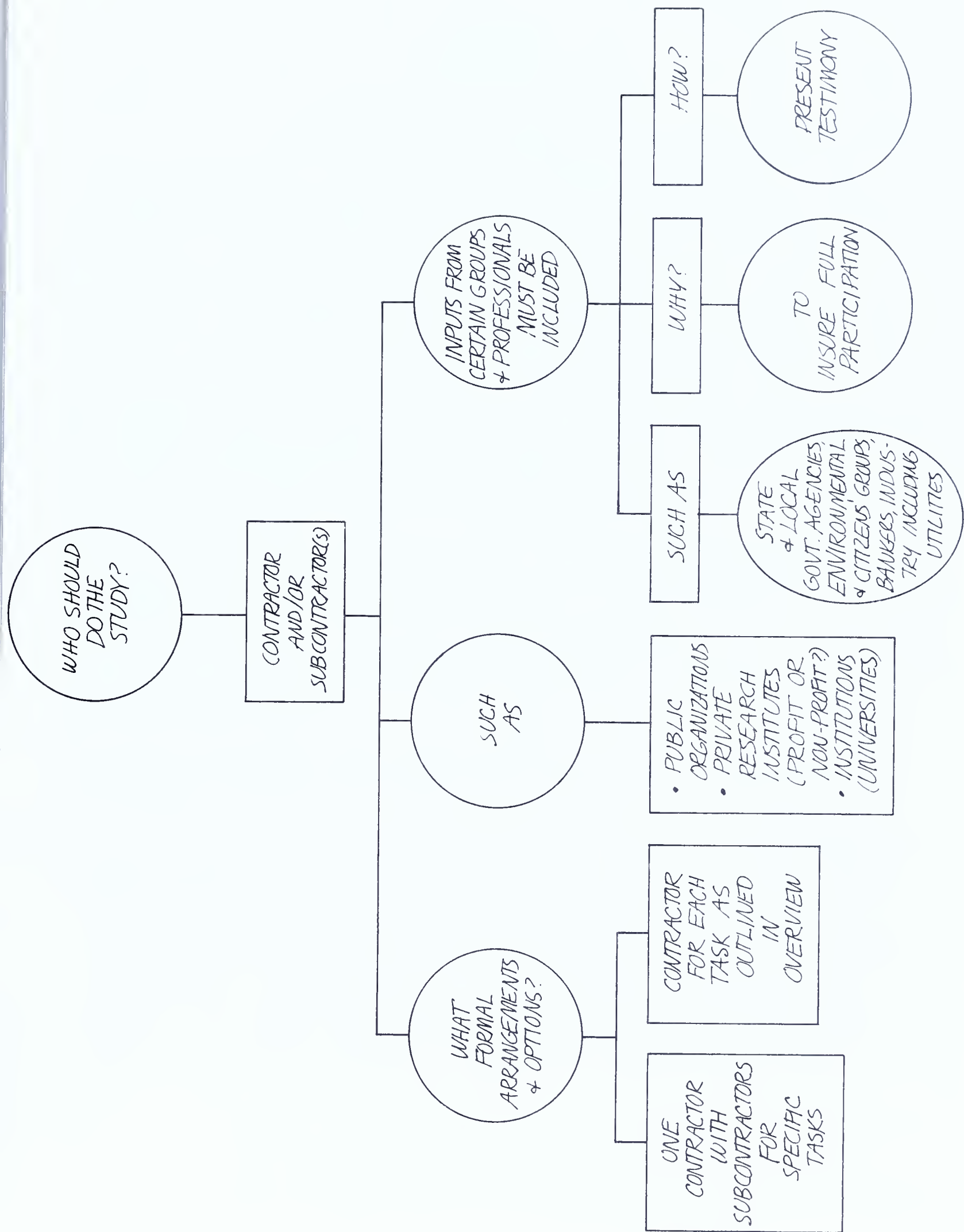
CONSIDERATION:

POLICY NEEDS

Issues requiring clear state and local policy determination and regulations include eminent domain, equity, financing, operations and management, environmental aspects while operating, and restoration. Land-use planning activities at the state and local levels must be included.

The climate for development will depend on existing and developing state policies, and on federal energy policy. What are the relevant policies, and how can coordinated policies and actions by different governmental agencies be achieved?







COMMONWEALTH OF PENNSYLVANIA
GOVERNOR'S OFFICE
HARRISBURG

WILLIAM B. HARRAL
EXECUTIVE DIRECTOR
ENERGY COUNCIL

February 25, 1975

Dr. Thomas Fox
Carnegie-Mellon University
Mellon Institute
4400 Fifth Avenue
Pittsburgh, Pennsylvania 15213

Dear Tom:

The Governor's Energy Council meeting of February 21st, the subject of large scale anthracite mining was presented by Al Smigel and discussed in some detail by the Council.

On motion seconded and passed unanimously, the Council voted to ask the Governor's Science Advisory Committee to recommend ways and means whereby a feasibility study could be conducted under the auspices of the Council.

More specifically, what we would like would be GSAC's advice on what areas a feasibility study would address itself, who would be the proper people to ask to do it, and about how much it would cost.

We know that Penn State has been doing some work in the field, but we are not sure exactly what it includes. I guess the most important question that the Council has is the economic feasibility of such a plan.

I might add that the Governor's Energy Council, possibly through an amendment to a current contract with the Federal Energy Administration, could provide a limited amount of funds for such a feasibility study -- say in the neighborhood of \$8,000. It would have to be quickly, however, because the money must be spent before June 30th. If you have any questions on the Council action, please give me a call. I certainly hope GSAC will be willing to undertake this limited project.

Sincerely,


William B. Harral

LARGE SCALE ANTHRACITE MINING*

BY
ALBERT E. SMIGEL

INTRODUCTION

Over the past 105 years of recorded Anthracite coal production, the high point was in 1917 -- a World War I anomaly -- when 100,445,299 net tons were produced in Pennsylvania. Average annual output of the 156,148 employees was 643.27 tons. This is of historic interest, but, more practically, we can examine the post-World War II production figures.

<u>5-Year Average</u>	<u>Production (Million Tons)</u>	<u>Employees</u>	<u>Tons/Yr./Employee</u>
1945-1949	55.99	79,430	704.90
1950-1954	37.18	62,751	592.50
1955-1959	23.88	31,209	765.16
1960-1964	16.93	15,970	1060.11
1965-1969	11.80	8,486	1390.53
1970-1974	7.21	4,928	1463.07

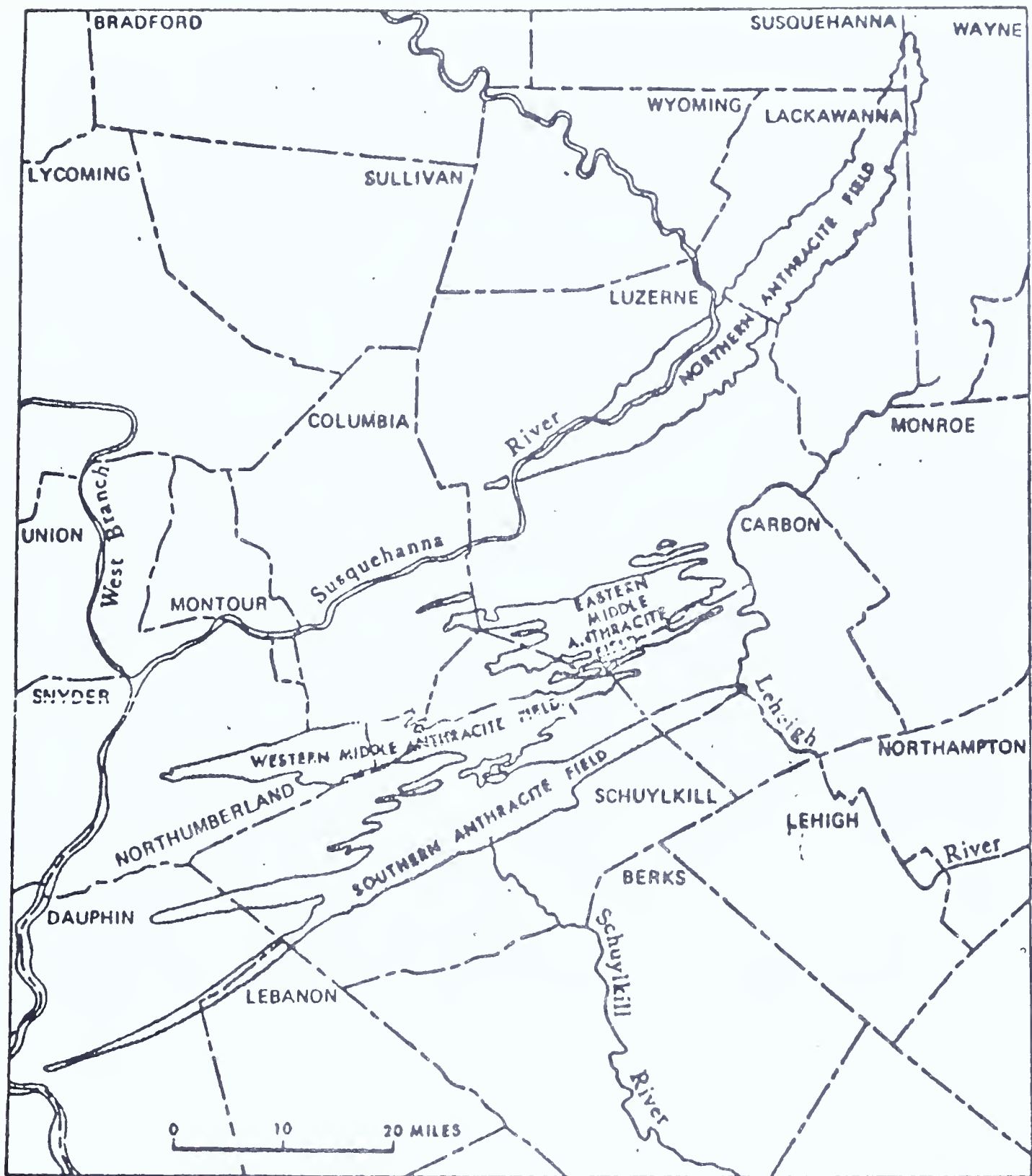
If we were to implement the concept discussed herein, it would be possible, in my judgment, to add at least 50 million tons to our Anthracite production.

THE CONCEPT

"If you have a lemon -- make lemonade." We have large amounts of one of nature's purest forms of carbon -- Anthracite Coal.

After consultation with Dr. Arthur A. Socolow, Pennsylvania State Geologist, I have made some judgments as to our ability to recover Anthracite economically.

*Adapted from presentation before Conference on Anthracite Technology, sponsored by the Office of Coal Research at the University of Scranton, January 6-7, 1975.



ANTHRACITE COAL FIELDS

This coal exists in a series of concentric nested capital U's. I have borrowed some data from a companion presentation (at the University of Scranton Conference) by Franklin H. Mohny, President of the Pennsylvania Coal Mining Association and of the Anthracite Institute. The map labeled "Anthracite Coal Fields" delineates the four coal fields. It is interesting to note that they consist of 489 square miles, or just slightly more than 1% of our total area. This proposal envisages dedicating just nine (9) square miles (of the 489) which will yield 50 million tons of readily-recoverable Anthracite.

My calculations are as follows:

1. 1,800 tons per acre/ft. (Bureau of Mines estimates)
2. or, 1,152,000 tons per square mile/ft.
3. or, 5,760,000 tons per square mile/5-ft.

(The latter estimate by Dr. Socolow is extremely conservative.

The average square mile contains 14,339,200 tons - based on data developed from Bureau of Mines Information Circular 8655, showing 7,012 million short tons reserves on January 1, 1974.

The numbers check, because Dr. Socolow's 5-ft. seam estimate represents just 40% of recoverable reserves in over 28-inch seams)

4. or, 51,840,000 tons per 9-square mile/5-ft.

In my view, the statistical underpinning cited above is solid. As to the concept, I consulted with many experts. I should note, especially, the contributions of Dr. Elburt F. Osborn, Distinguished Professor at the Carnegie Institute of Washington, a former Bureau of Mines' chief; Dr. Joseph Corgan, a Coal Consultant, predecessor of Dr. Osborn as Bureau of Mines' Chief; and Richard H. Demmy, Vice President of UGI.

Underground Anthracite Reserve Base
By County
January 1, 1974

MILLION SHORT TONS

COUNTY	28" to 42"	Over 42"	TOTAL
Carbon	48.86	46.94	95.80
Columbia	91.09	87.92	179.01
Dauphin	184.95	177.70	362.65
Lackawanna	186.30	178.99	365.29
Lebanon	229.24	220.24	449.48
Luzerne	304.09	292.19	596.28
Northumberland	366.69	352.30	718.99
Schuylkill	2,163.53	2,078.63	2,242.16
Wayne	1.23	1.18	2.41
Total	3,575.98	3,436.09	7,012.07

SOURCE: "The Reserve Base of Bituminous Coal and Anthracite for Underground Mining in the Eastern United States"

Bureau of Mines Information Circular 8655

ANTHRACITE FIELDS

Northern	176 square miles
Eastern Middle	33 square miles
Western Middle	94 square miles
Southern	181 square miles

We can learn from the German experience. At Kittlitz, East Germany, each year an area of roughly 350 acres is open-pit mined for lignite, also known as "brown coal". They mine 60,000 tons a day or approximately 20,000,000 tons a year. We don't figure on 25-foot seams, as in East Germany, but we are mining a site more than 16 times as large. It is interesting that the huge steamshovels are operated by women.

The overlay is about 120 feet thick in this operation. Water is pumped from around the site to facilitate coal removal. The land is fully restored and is ready for cultivation. The site feeds two nearby coal-generating electric power plants.

The idea of surface (open-pit) mining to a depth of 1,000 feet is not new. The most sophisticated example is the Kennecott Copper operation which has been described so well by S. D. Michaelson, Kennecott's Chief of Mining. They have done more than we would be required to do.

Here's how it works (oversimplified):

1. Geologic Survey finds sites which are coal-intensive.
2. We screen them for availability by purchase.
3. A site is selected and bought by "the group".*
4. A one-package environmental impact proposal is prepared.
5. After the O.K. massive earth-moving equipment and other machinery are brought on site.
6. Electric generating plants are brought on site.
7. Mine the coal, gas, etc.
8. Make electricity.
9. Rehabilitate the land.

*To be discussed hereinafter.

It is not within the purview of this paper to discuss the refinements of this plan, but rather to enunciate the nitty-gritty. I shall present, therefore, several topics which require some explication.

SCALE OF THE PROJECT

The purchase of nine (9) square miles of Anthracite land necessitates a sum of money that can be handled. However, project costs will be very high -- but not high when measured as a fraction of potential product. Without putting a number on it, I believe it would take a U. S. Steel or, more probably, a consortium composed of Electric Utilities and other industries.

In addition to providing a guaranteed supply of raw material, the project produces a commodity whose resale value is several billion dollars.

Proponents of the energy park will recognize that this plan encompasses the energy park, but goes beyond it. This plan is not constrained by our present approach -- merely increasing equipment size within the framework limitations of the orthodox, usual surface-mining plans and practices. Instead, the way is open to design and build new equipment. We have the technological capabilities to fit the practices to the plans, not, as we are prone to do, fit the plans to the practices.

I refer to the productivity table in the Introduction. This big concept will provide improved productivity, lower unit-labor costs and lower unit-product costs. Because of this and because the profits will be great, the project will attract the necessary capital. In the capital competition game the player with the best productivity will get the money, because productivity affects the return on investment -- which is the real name of the game.

SOME ADVANTAGES

We can take advantage of Economies of Scale.

The water problem is alleviated greatly.

The manpower become a manageable problem. Instead of long training periods for deep miners, we can train heavy-construction type workers much more quickly.

Slope-line technology of our copper mines is readily translatable to our needs.

Restoration and rehabilitation of the mined-out land can be accomplished more easily and to a higher degree.

Productivity is more than twice as great as for deep mining.

In addition to many jobs and dollars for Pennsylvania, each fifty million tons annual production project would reduce our imports of foreign oil by 230 million barrels.

All environmental requirements could be handled up-front in one package.

Pollution could be dealt with on a large scale, employing the most sophisticated equipment.

Instead of hauling coal by truck and railroad to electric generating plants, the coal would be burnt on site.

The perimeter area of the dedicated sites would become the strategic location for service-related industries.

Wellman-Galusha (Lord) 150 BTU plants could be installed. (20 tons of coal yields 500,000 cubic feet of gas).

The lead time is not as great as for shale oil and the like.

SOME DISADVANTAGES

Large capital requirements.

The inability of most people to think in new ways. They feel safer if they follow the crowd and act conventionally. Don't make waves! Don't rock the boat!

The large scope of the projects scares some people.

CONCLUSION

The future economic health of our Anthracite regions and our Commonwealth is at stake. The Country needs the BTUs. We have them below ground. We can't get them out with present methods. Something big and new is needed. I believe this plan will work.

APPENDIX D

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